NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD

WATERING FACILITY

(No.)

CODE 614

DEFINITION

A device (tank, trough, or other watertight container) for providing animal access to water.

PURPOSE

To provide watering facilities for livestock and/or wildlife at selected locations in order to:

- protect and enhance vegetative cover through proper distribution of grazing;
- provide erosion control through better grassland management; or
- protect streams, ponds and water supplies from contamination by providing alternative access to water.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to all land uses where there is a need for new or improved watering facilities.

CRITERIA

General Criteria Applicable to All Purposes

A trough or tank shall have adequate capacity to meet the water requirements of the livestock and/or wildlife. This will include the storage volume necessary to carry over between periods of replenishment. Animal *average* water requirements can be obtained from the NRCS Engineering Field Handbook, Table 11-1.

Where water supplies are dependable and livestock are checked daily, troughs with little water storage capacity may be used. Troughs or tanks must provide the daily water requirement of the livestock and provide access to the entire herd within a short period of time. *Water may be provided from a single water storage facility located at the water source or at any site convenient to the watering facilities. Two or more water storage facilities at different locations may be required to provide adequate storage where more than one watering facility is served by a single installation.*

All livestock utilizing an installation may drink during a relatively short period of time each day and the water supply must be adequate to meet this demand. The following may be used for determining minimum daily requirements: horses and beef cattle, 15 gallons; dairy cattle, 30 gallons; sheep or goats, 2 gallons; and swine, 4 gallons. These requirements may vary with climatic conditions, kinds of feed, and other factors. The water storage facility or combination storage and watering facility should provide sufficient capacity for at least a week's water demand. As a general rule the weaker the well, the greater the need for additional storage.

Troughs should have a minimum capacity of 50 gallons and a minimum depth of 18 inches for horses, beef, and dairy cattle. For sheep and goats, the minimum capacity should be 15 gallons with a minimum depth of 6 inches.

The site shall be well drained; if not, drainage measures shall be provided. Areas adjacent to the trough or tank that will be trampled by livestock shall be graveled, paved, or otherwise treated to provide firm footing and reduce erosion. Design of the protective

surface around the trough shall be in accordance with NRCS Conservation Practice Standard 561, Heavy Use Area Protection.

Automatic water level control and/or overflow facilities shall be provided as appropriate. Valves or pipes shall be protected by shields or covers to prevent damage by livestock. Overflow shall be piped to a stable or suitable point of release. The trough, *inlet* and outlet pipes shall be protected from freezing and ice damage. Freeze-proof troughs or electric heaters may be used. *Provisions must be made for suitable overflow, drain, and outlet pipe to insure satisfactory operation of the water facility.*

When a roof is placed over the trough to provide shade, the roof shall be designed for appropriate snow and wind loads and shall be durable to withstand anticipated livestock and wildlife activities.

MATERIALS

All materials shall have a life expectancy that meets or exceeds the planned useful life of the installation. Common construction materials are reinforced concrete, steel, rubber, fiberglass, plastic and wood. All designs shall meet the industry standards for the material being used. Generally applicable design requirements and procedures can be found in the documents referenced at the end of this standard.

All fiberglass storage tanks and troughs shall be manufactured in accordance with ASTM D-4097 or ASTM D-3299. All plastic pipe shall comply with material specifications in NHCP Standard, 430-DD.

Concrete structures shall be constructed from a concrete mix producing a minimum compressive strength of 3,000 psi at 28 days. Galvanized steel tanks shall have a minimum thickness of 20 gauge. Plastic and fiberglass structures shall be made of ultraviolet resistant materials or shall have a durable coating to protect the structure from deterioration due to sunlight.

PLUMBING

Plumbing must be new galvanized, copper, bronze, or plastic pipe.

Storage facilities or troughs shall be equipped with a water supply outlet, drainage outlet and overflow outlet, either as individual outlets or combinations of outlets. On fiberglass structure outlets short nipples of fiberglass pipe as a part of the plumbing are acceptable if equal in quality to the storage tank material. PVC plastic schedule 40 unthreaded, or schedule 80 threaded pipe may be used. Galvanized steel pipe as shown in approved standard drawings for concrete water storage facilities contained in Appendix A of the Engineering Field Manual is acceptable. Closed top tanks shall be vented in accordance with the manufacture's recommendations.

CONSIDERATIONS

This practice may adversely affect cultural resources and must comply with GM 420, Part 401.

Topography should be evaluated to minimize trail erosion and flooding erosion from tank overflow.

Watering facilities should be accessible to small animals. Escape ramps for birds and small animals should be installed.

Adequate protection for livestock during the winter should be considered.

PLANS AND SPECIFICATIONS

Plans and specifications for installing troughs and tanks shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose. If the trough and/or tank are a component of a system that includes additional conservation practices, the information necessary to construct these additional practices will also be conveyed on the plans.

The foundation shall be prepared by leveling and smoothing area where facility is to be installed. Surface drainage problems shall be eliminated. A minimum of 4-inch layer of loose friable material under the facility is required. This layer shall be free of debris and rocks or

pebbles larger than 1/2 inch in diameter. Where drains are used in the floor, the pipe outlet from the drain shall be positioned prior to final smoothing of the foundation.

Development of plans will be guided by Engineering Field Handbook, Chapter 5, and shall be in accordance with National Engineering Manual, Parts 541 and 542.

Precast concrete troughs manufactured under plant control conditions must have minimum 3" wall thickness except that this wall thickness shall be increased to 4" where corrosive conditions are expected. All manufactured troughs shall have drains and overflow devices as needed. Galvanized troughs shall not be used where corrosive water or soil conditions are encountered.

CERTIFICATION

The manufacturer of tank shall furnish to the contractor or buyer a certification that the tank supplied meets the tank material and manufacturing requirements of ASTM D-4097 or ASTM D-3299 for fiberglass tanks, or ACI 318, American Concrete Institute specification for precast concrete troughs.

STABILITY

Prefabricated, non-concrete, water storage tanks will require protection against overturning and sliding from wind forces. This may be accomplished by maintaining a minimum required water depth in the tank or by installing suitable rod anchors into the soil or rock underlying the tank. Anchors for water storage facilities should be installed according to manufacturer recommendations.

When protection against overturning and sliding for prefabricated non concrete tanks is accomplished by maintaining a minimum required water depth in the tank, the minimum water depth in feet shall be that determined by the following expression:

$h_w = 0.735(h/d)^2 + 1.33\ h/d$

Where, h_w is the required minimum depth of water to be maintained, in feet of depth.

h is the height of the tank, in feet.

D is the diameter of the tank, in feet.

(Example: Tank of 12 feet in height and 8 feet in diameter.

$h_w = 0.735\ (12/8)^2 + 1.33\ (12/8) = 0.735\ (1.5)^2 + 1.33\ (1.5)$

$h_w = 1.65 + 1.99 = 3.6$ feet, (rounded off)

To assure that the minimum water depth for stability is not unknowingly withdrawn below the required depth, the water supply outlet pipe shall (1) be fitted through the sidewall of the tank at the distance "hw" above the floor of the tank, or (2) be made as a standpipe through the bottom of the tank with the height of the standpipe within the tank being the distance "hw" above the inside floor. A sluice valve may be placed at the bottom of the tank for cleanout and maintenance, but the supply outlet shall not be connected to such cleanout facility.

Water troughs shall be permanent installations and will require protection against overturning and sliding from wind forces. When the water trough is equipped with an automatic inflow float valve at a pressurized inflow supply line, and the water level is maintained at or near full capacity, no further protection for stability is required. Without such provisions for automatically maintaining a near-filled tank, anchors to the trough shall be installed. Such anchors shall be a minimum of three in number equally spaced on the perimeter, and be screw anchors, embedded anchors, or grouted rock anchors 2 feet deep.

Standard drawings for typical poured-in-place storage facilities and rubber tire troughs have been approved for use and are filed in Appendix "A", Engineering Field Manual for Conservation Practices. The standard drawings are listed as follows:

4-N-13148, Rev. 4-59- Water Storage Facility, Poured Reinforced Concrete Floor with Reinforced Concrete Plaster Walls (Max. 5' Height and Max. 25' Diameter)

4-N-13149, Rev. 6-63- Water Storage Facility, Poured Reinforced Concrete Flood with Steel Plate or Corrugated Metal Walls (Max. 6' Height and Max. 30' Diameter)

4-R-13766, Dated 10-59 - Water Storage Facility, Poured Reinforced Concrete Floor with Formed Reinforced Concrete Walls (Max. 5' Height and Max. 30' Diameter)

4-R-13767, Dated 10-59 - Water Storage Facility, Poured Reinforced Concrete Floor with Formed Reinforced Concrete Walls (Max. 8' Height and Max. 25' Diameter)

4-R-15840, Dated 8-61 - Water Storage Facility, Poured Reinforced Concrete Floor with Reinforced Concrete and Plaster Walls (Max. 5' Height and Max. 30' Diameter)

4-E-26873, Dated 8-68 - Water Storage Facility, Formed Concrete (Max. 7' Height and Max. 40' Diameter)

4-L-36931, Dated 12-78 - Water Storage Facility, Poured Reinforced Concrete Floor with Steel Plate Walls (Max. 6' Height and Max. 50' Diameter)

TX-EN-0057, Rectangular Concrete Water Storage Tank

TX-EN-0058, 20 Ft x 20 Ft x 5 Ft Concrete Storage Tank

TX-EN-0059, 30 Ft x 30 Ft x 5 Ft Concrete Storage Tank

TX-EN-0423, Heavy Equipment Tire Trough

OPERATION AND MAINTENANCE

An O&M plan specific to the type of installed trough or tank shall be provided to the landowner. The plan shall include, but not be limited to, the following provisions:

- check for debris, algae, sludge or other materials in the trough which may restrict the inflow or outflow system;
- check for leaks and repair immediately if any leaks are found;
- check the automatic water level device to insure proper operation;
- check to ensure that adjacent areas are well protected against erosion;
- check to ensure the outlet pipe is freely operating and not causing erosion problems; and
- prepare guidance for winter weather, such as adding material in the storage area to allow for ice expansion without damage.

Algae and iron sludge accumulation should be addressed in areas with water quality that is known to cause problems. Chemicals such as copper sulfate and chlorine can be recommended as needed, as long as local rules and regulations are followed.

REFERENCES

Engineering Field Handbook

National Engineering Manual

Manual of Steel Construction, American Institute of Steel Construction

Timber, National Design Specification for Wood, American Forest and Paper Association

Concrete, ACI 318, American Concrete Institute

Masonry, Building Code Requirement for Masonry Structures, ACI 530, American Concrete Institute

Fiberglass Tank - ASTM D-4097 and ASTM D-3299.

APPROVAL AND CERTIFICATION

WATERING FACILITY

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PRACTICE STANDARD APPROVED:

_____/s/ John Mueller_____ **_____7/31/02_____**

State Conservation Engineer **Date**

NRCS, Texas
June, 2002